IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Applicant	:	Martin Williamson
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Examiner	:	Dinh, Bach T.
Docket No.	:	H27363 9930/98019
Customer No.	:	92556
Title	:	LIQUID ELECTROLYTE GAS SENSOR COMPRISING RIGID POROUS ELECTRODE SUPPORT

Confirmation No.: 7364

CERTIFICATE OF TRANSMISSION

I hereby certify that this paper is being transmitted via the Office electronic filing system in accordance with § 1.6(a)(4) on this 23th day of March, 2012.

Jon P. Christensen

APPELLANT'S BRIEF UNDER 37 CFR §41.37

Mail Stop: Appeal Brief
Commissioner for Patents
P.O. Box 1450
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Sir:

In response to the final rejection of February 15, 2012, the applicant requests consideration of the following:

I. Real Party in Interest.

The real party in interest is Honeywell International, Inc.

II. Related Appeals and Interferences.

None.

III. Status of Claims.

Claims 1-11 and 13-19 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Pat. No. 4,769,122 to Marrese et al. in view of U.S. Pat. No. 6,410,189 to Yamada et al. Claim 12 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Pat. No. 4,769,122 to Marrese et al. in view of U.S. Pat. No. 6,410,189 to Yamada et al. and U.S. Pat. No. 5,372,696 to Kiesele et al. The rejections of claims 1-11 and 13-19 are the subject of this appeal.

IV. Status of Amendments.

The claims have not been amended since the final Office Action of February 15, 2012.

V. Summary of Claimed Subject Matter.

Claim 1 is limited to "An electrochemical gas sensor." The electrochemical gas sensor is discussed in general throughout the specification (e.g., page 4, lines 26-27) and is shown in FIG. 1.

Claim 1 is further limited to "a working electrode comprising a gas porous membrane and a catalyst layer formed on one side of the membrane." The working electrode 14 including a gas porous membrane and a catalyst layer formed on one side of the membrane is discussed on page 4, lines 28-29 and in the paragraph bridging pages 7-8 and is shown in FIG. 1.

Claim 1 is further limited to "a counter electrode that includes a catalyst." The counter electrode 16 that includes a catalyst is discussed in the first line of page 5, in the paragraph bridging pages 7-8 and is shown in FIG. 1.

Claim 1 is further limited to "electrolyte in contact with the catalyst both of the working electrode and of the counter electrode." The electrolyte in contact with the catalyst both of the working electrode and of the counter electrode is discussed in lines 2-3 of page 5, in the paragraph bridging pages 7-8 and in the first full paragraph of page 9.

Claim 1 is further limited to "a support which is one of rigid or semi-rigid, the support is in contact with, and presses against a side of the working electrode remote from the electrolyte to compress the electrodes and the electrolyte together, the support having a thickness of only approximately 0.1 mm thick and wherein the support defines a plurality of open areas allowing gas to contact the membrane, the surface area of that portion of the support between the open areas being less than 40% of the combined surface area of the open areas and that portion of the support between them." The support 24 which is one of rigid or semi-rigid, the support is in contact with, and presses against a side of the working electrode remote from the electrolyte to compress the electrodes and the electrolyte together, the support having a thickness of only approximately 0.1 mm thick and wherein the support defines a plurality of open areas allowing gas to contact the membrane, the surface area of that portion of the support between the open areas being less than 40% of the combined surface area of the open areas and that portion of the

support between them is discussed beginning in line 4 of page 5 and continuing through line 4 of page 7. The support 24 is also discussed in the third full paragraph of page 5, beginning in line 5 of page 9 and continuing through line 19 of page 10 and is shown in FIGs. 1-3.

Claim 4 is limited to "An electrochemical gas sensor." The electrochemical gas sensor is discussed in general throughout the specification (e.g., page 4, lines 26-27) and is shown in FIG. 1.

Claim 4 is further limited to "a working electrode comprising a gas porous membrane and a catalyst layer formed on one side of the membrane." The working electrode 14 including a gas porous membrane and a catalyst layer formed on one side of the membrane is discussed on page 4, lines 28-29 and in the paragraph bridging pages 7-8 and is shown in FIG. 1.

Claim 4 is further limited to "a counter electrode that includes a catalyst." The counter electrode 16 that includes a catalyst is discussed in the first line of page 5, in the paragraph bridging pages 7-8 and is shown in FIG. 1.

Claim 4 is further limited to "electrolyte in contact with the catalyst both of the working electrode and of the counter electrode." The electrolyte in contact with the catalyst both of the working electrode and of the counter electrode is discussed in lines 2-3 of page 5, in the paragraph bridging pages 7-8 and in the first full paragraph of page 9.

Claim 4 is further limited to "a support that is in contact with, and presses against a side of the working electrode displaced from the electrolyte to compress the electrodes and the electrolyte together, such support comprising a plurality of open areas that enable gas to contact the membrane, the support including solid regions that extend between the open areas for contacting and supporting the membrane, such solid regions having a thickness of only approximately 0.1 mm and having a width on the order of one of less than 0.3 mm, or less than 0.2 mm, and wherein the aggregate surface area of the solid regions is less than 40% of the combined surface area of the support, including

the open areas." The support 24 that is in contact with, and presses against a side of the working electrode displaced from the electrolyte to compress the electrodes and the electrolyte together, such support comprising a plurality of open areas that enable gas to contact the membrane, the support including solid regions that extend between the open areas for contacting and supporting the membrane, such solid regions having a thickness of only approximately 0.1 mm and having a width on the order of one of less than 0.3 mm, or less than 0.2 mm, and wherein the aggregate surface area of the solid regions is less than 40% of the combined surface area of the support, including the open areas is discussed in the third full paragraph of page 5, beginning in line 4 of page 5 and continuing through line 4 of page 7. The support 24 is also discussed beginning in line 5 of page 9 and continuing through line 19 of page 10 and is shown in FIGs. 1-3.

Claim 13 is limited to "An electrochemical gas sensor." The electrochemical gas sensor is discussed in general throughout the specification (e.g., page 4, lines 26-27) and is shown in FIG. 1.

Claim 13 is further limited to "a housing that defines an internal region." The housing 10 that defines an internal region is discussed in the paragraph bridging pages 7-8 and is shown in FIG. 1.

Claim 13 is further limited to "first and second electrodes carried by the housing in the region." The first and second electrodes 14, 16 carried by the housing 10 in the region is discussed in the paragraph bridging pages 7-8 and are shown in FIG. 1.

Claim 13 is further limited to "an electrolyte between the electrodes." The electrolyte between the electrodes is discussed in lines 2-3 of page 5, in the paragraph bridging pages 7-8 and in the first full paragraph of page 9.

Claim 13 is further limited to "a retaining mesh that is attached to the housing and is only approximately 0.1 mm thick, covering a predetermined area of one of the electrodes and which

presses the one electrode and the electrolyte toward the other electrode, an open portion of the mesh exceeds 60% of the area covered by the mesh." The retaining mesh 24 that is attached to the housing and is only approximately 0.1 mm thick, covering a predetermined area of one of the electrodes and which presses the one electrode and the electrolyte toward the other electrode, an open portion of the mesh exceeds 60% of the area covered by the mesh is discussed beginning in line 4 of page 5 and continuing through line 4 of page 7. The support 24 is also discussed beginning in line 5 of page 9 and continuing through line 19 of page 10, in original claim 13 and is shown in FIGs. 1-3.

VI. Grounds of Rejection to be Reviewed on Appeal.

The rejections of claims 1-11 and 13-19 as being unpatentable over U.S. Pat. No. 4,769,122 to Marrese et al. in view of U.S. Pat. No. 6,410,189 to Yamada et al. are appealed.

VII. Argument.

A. Claims 1-11 And 13-19 Are Not Unpatentable Over Marrese et al. In View Of Yamada et al.

Claims 1-11 and 13-19 are believed to be clearly differentiated over Marrase et al. and Yamada et al. In this regard, Marrase et al. fails to disclose "a support which is one of rigid or semi-rigid, the support is in contact with, and presses against a side of the working electrode remote from the electrolyte to compress the electrodes and the electrolyte together, the support having a thickness of only approximately 0.1 mm thick and wherein the support defines a plurality of open areas allowing gas to contact the membrane, the surface area of that portion of the support between the open areas being less than 40% of the combined surface area of the open

areas and that portion of the support between them." Yamada et al. merely discloses a current collector for a battery.

Moreover, the limitation of "the support having a thickness of only approximately 0.1 mm" is functional on a number of different levels. On a first level, "the bars are so thin that the act of diffusing through the porous PTFE layer spreads the gas out to reach an extend that catalyst lying directly underneath these bars or struts 30 will receive target gas" (specification, first full paragraph of page 10).

On another level, those of skill in the art would understand that the claimed thickness is structural. In this regard, "the support ... presses against ... the working electrode ... to compress the electrodes and electrolyte together" (claim 1, lines 8-10). As noted above, Marrese et al. doesn't disclose the claimed support.

Yamada et al. discloses an electrode that is merely formed into a laminate within a battery. The thicknesses of the Yamada et al. electrode "range from 5 to 100 μm" (Yamada et al., col. 3, lines 59-60). As would be well known to those of skill in the art, the 5 to 100 μm would not provide structural support in the context of the claimed invention.

The Office Action asserts that

> "Marrise discloses ... a support ... The support defines a plurality of open areas 68 allowing gas to contact the membrane (9:63-66); furthermore, the element 58 that has the open areas 68 provides electrical contact to the electrode (6:28-51). Marrese is silent regarding the support having a thickness of only approximately 0.1 mm and the surface area of the support between the open areas being less than 40% of the combined area of the open areas and that portion of the support between them. Yamada discloses a current collector for an electrode in an electrochemical device (abstract), which performs the same function as the conductive element 58 of Marrese. Furthermore, the current collector of Yamada has a thickness of 100 microns or only approximately 0.1mm (5:37-39) and defines a plurality of open areas (figure 5) and the surface area of the portion of the support between the open areas being less than 40% of the combined surface area of the open areas and that portion of the support between them according to

> the following calculations. The dimension a is 0.1 to 5 mm and the dimension b is 0.1 to 5 mm, for the calculation, assuming a is 4 mm and b is 0.1 mm and the area in figure 5 below is used as an example. The area of the hexagon is calculated by equations ((3q3)/2)*L 2 or (43/2)*W2 (according to http://homepage.mac.com/terhorabO1og/B1032916816/C181698761/E174145342 /Media lhexagonArea.pdf) where L is the side length and W is the width between two parallel sides of the hexagon. The area of the portion between the hexagons are divided into a plurality of equilateral triangles with each side equals to the dimension b and rectangles with the width equals to the dimension b and the length equals to the side of the hexagon or half of the dimension a according to the source above. Thus, the area for each hexagon is 10.39 mm2, the area for each rectangle is 0.2mm 2 and the area for each triangle is 0.0043 mm2. The section of figure 5 below has 7.5 hexagons, 20.5 rectangles and 15 triangles; therefore, the total area of the section of figure 5 below is 82.09 mm^2 and the percentage of surface area of the portion between the hexagons and the total area of the section below is 5.073%
> ...
>
> At the time of the invention, one with ordinary skill in the art would have found it obvious to modify the current collector 58 of Marrese to have the hexagonal openings with the dimensions for the current collector of Yamada or by substituting with the current collector of Yamada because the current collector with the dimensions of Yamada provides electrical connection to the sensing electrode with the openings that allow the diffusion of incoming gas as required by Marrese as well as having low combined resistances and reducing the average current migration lengths within the current collector (Yamada, 2:30-37)" (Office Action of 2/15/12, paragraphs bridging pages 4-5).

However, the Marrese sensor contact 58, 62 having the open areas 68 does not in any way directly make contact with the Marrese sensing electrode 50. And, even if it did, the Marrese sensor contact 58 does not meet the claim limitation requiring that "the surface area of that portion of the support between the open areas being less than 40% of the combined surface area of the open areas and that portion of the support between them" (claim 1, lines 11-13).

In effect, the Office Action attempts to merge the claimed "working electrode" and "support." However, under the claimed invention, the working electrode and support perform different functions and are structurally different. For example, the claimed invention is directed to "a working electrode comprising a gas porous membrane and a catalyst layer formed

on one side of the membrane ... and a support which is one of rigid or semi-rigid, the support is in contact with, and presses against a side of the working electrode remote from the electrolyte to compress the electrodes and the electrolyte together." In contrast, Marrese et al. states that "The central portion of the sensor contact 62 is spaced away from the sensing electrode 50 by the thickness of the conductive ring 52. The sensor contact 62 provides an external electrical connection to the sensing electrode 50 and protects the fragile sensing electrode 50 from being physically contacted, except by a gas, and possibly damaged" (Marrese et al., col. 6, lines 45-51). Stated in another way, Marrese et al. asserts that the central part of the sensing electrode 50 should not be physically contacted except by a gas. This is completely contrary to the claimed invention where the claimed "support ... presses against ... the working electrode."

The Office Action blithely ignors the express teachings of Marrese and suggests that somehow the Marrese et al. working electrode 50 would be modified by the Yamada et al. electrode 12. However, by the express teachings of Marrese et al., the Marrese et al. electrode 50 is fragile and should not be physically contacted except by a gas. As would be apparent to those of skill in the art, modifying the Marrese et al. electrode 50 by creating more holes (as under Yamada et al.) would weaken the Marrese et al. electrode 50 and potentially make the Marrese et al. electrode 50 unsuitable for its intended purpose.

The claimed invention solves the problem of fragile working electrodes through the use of the "support which ... presses against ... the working electrode." This is not possible under Marrese et al. (even as modified by Yamada) because Marrese explicitly states that the Marrese et al. working electrode 50 is not to be physically contacted except by a gas.

Since Marrese et al. and Yamada et al. and the combination of Marrese et al. and Yamada et al. do not disclose the above features (including the "support which ... presses

against ... the working electrode), the combination fails to disclose each and every limitation of the claimed invention. Since the combination fails to teach or suggest each and every limitation of the claimed invention, the rejections are now improper and should be overturned.

B. A Prima facie Case of Obviousness Has Not Been Established.

The Federal Circuit has continually held that the Examiner has the burden under 35 U.S.C. §103 of establishing a prima facie case of obviousness. In re Oetiker, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992); In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). This burden may be satisfied only by showing that some objective teaching in the prior art or knowledge generally available to one of ordinary skill in the art would lead that individual to the claimed invention. For example, as the Federal Circuit has held recently, as well as on numerous other occasions: "[t]here must be some reason, suggestion or motivation found in the prior art whereby a person of ordinary skill in the field of the invention would make the combination." In re Oetiker, supra, 24 USPQ2d at 1446.

Moreover, the mere fact that the prior art references could be modified in the manner proposed by the Examiner would not have made the modification obvious unless there is some motivation or suggestion in the prior art to do so. In re Gordon, 773 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984), also see In re Fritch, 972 F.2d 1260, 23 USPQ2d 1781, 1783 (Fed. Cir. 1992) (The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification).

When making an assessment of the obviousness of the claimed invention, the prior art, viewed as a whole, must "suggest the desirability, and thus the obviousness, of making

the combination." In re Beattie, 974 F.2d 1309, 24 USPQ2d 1040 (Fed. Cir. 1992), quoting Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co., 730 F.2d 1452, 1462, 221 USPQ 481, 488 (Fed. Cir. 1984). Similarly, the Examiner, under §103, must consider the claimed subject matter "as a whole". In assessing the claimed subject matter "as a whole", the results and advantages of the claimed invention must be considered. Diversitech Corp. v. Century Steps, Inc., 850 F.2d 675, 7 USPQ2d 1315 (Fed. Cir. 1988); In re Chupp, 816 F.2d 643, 2 USPQ2d 143 (Fed. Cir. 1987).

It is incumbent upon the Examiner to demonstrate that the proposed combination of reference teachings is proper. Where no express teaching or suggestion is apparent from the references, the Examiner must establish, with evidence or reasoning, why one skilled in the art would have been led by the relevant teachings of the applied references to make the proposed combination. In re Gordon, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984); ACS Hospital System, Inc. v. Montefiore Hospital, 732 F.2d 1572, 221 USPQ 929 (Fed. Cir. 1984). When making an obviousness rejection, "[i]t is impermissible, however, simply to engage in hindsight reconstruction of the claimed invention, using the applicant's structure as a template", In re Gorman, 933 F.2d 982, 18 USPQ2d 1885 (Fed. Cir. 1991).

Applicant submits that it does not require a close examination of the record to determine that the Examiner has failed to meet the burden of establishing a prima facie case of obviousness. On a first level, neither Marrese et al. or Yamada et al. are directed to sensors for low concentrations of gas.

However, there is an even more fundamental reason why the rejections are improper. The reason that the rejections are improper is because neither Marrese et al. or Yamada et al. recognize the advantages of providing "a support which is one of rigid or semi-

rigid, the support is in contact with, and presses against a side of the working electrode remote from the electrolyte to compress the electrodes and the electrolyte together, the support having a thickness of only approximately 0.1 mm thick and wherein the support defines a plurality of open areas allowing gas to contact the membrane, the surface area of that portion of the support between the open areas being less than 40% of the combined surface area of the open areas and that portion of the support between them" (claim 1, lines 7-13).

In general, the Examiner has failed to establish any credible basis for why one skilled in the art would have been led by the references or common sense to make the claimed invention. For the foregoing reasons, allowance of claims 1-4 and 6-29, as now presented, is believed to be in order. It is respectfully requested that the Board reverse the Examiner in all respects.

Closing Remarks

The Commissioner is hereby authorized to charge any additional fee which may be required for this application under 37 C.F.R. §§ 1.16-1.18, 1.27 or §41.20, including but not limited to the issue fee, or credit any overpayment, to Deposit Account No. 23-0920. Should no proper amount be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal, or even entirely missing, the Commissioner is authorized to

charge the unpaid amount to Deposit Account No. 23-0920. *(If filed by paper, a duplicate copy of this sheet(s) is enclosed).*

Respectfully submitted,
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VIII. APPENDIX OF THE CLAIMS

1. (Rejected) An electrochemical gas sensor comprising:

a working electrode comprising a gas porous membrane and a catalyst layer formed on one side of the membrane;

a counter electrode that includes a catalyst;

electrolyte in contact with the catalyst both of the working electrode and of the counter electrode; and

a support which is one of rigid or semi-rigid, the support is in contact with, and presses against a side of the working electrode remote from the electrolyte to compress the electrodes and the electrolyte together, the support having a thickness of only approximately 0.1 mm thick and wherein the support defines a plurality of open areas allowing gas to contact the membrane, the surface area of that portion of the support between the open areas being less than 40% of the combined surface area of the open areas and that portion of the support between them.

2. (Rejected) A sensor as claimed in claim 1, wherein that portion of the support, between the open areas, is in the form of elongated members, having a width less than 0.5mm.

3. (Rejected) A sensor as in claim 2 where the elongated members have a width less than one of .3mm or .2mm.

4. (Rejected) An electrochemical gas sensor comprising:

a working electrode comprising a gas porous membrane and a catalyst layer formed on one side of the membrane;

a counter electrode that includes a catalyst;

electrolyte in contact with the catalyst both of the working electrode and of the counter electrode; and

a support that is in contact with, and presses against a side of the working electrode displaced from the electrolyte to compress the electrodes and the electrolyte together, such support comprising a plurality of open areas that enable gas to contact the membrane, the support including solid regions that extend between the open areas for contacting and supporting the membrane, such solid regions

having a thickness of only approximately 0.1 mm and having a width on the order of one of less than 0.3 mm, or less than 0.2 mm, and wherein the aggregate surface area of the solid regions is less than 40% of the combined surface area of the support, including the open areas.

5. (Rejected) A sensor as claimed in claim 4 wherein the support has a thickness of not greater than .5 mm.

6. (Rejected) A sensor as in claim 5 where the thickness is less than one of .4 mm, .3 mm or .2 mm.

7. (Rejected) A sensor as in claim 4 wherein the regions of the support between the open areas are in the form of elongated linear members.

8. (Rejected) A sensor as in claim 4 wherein the surface area of the support between the open areas is less than one of 30%, 20% or 10% of the surface area of the support.

9. (Rejected) A sensor as in claim 4 which includes a reference electrode.

10. (Rejected) A sensor as in claim 4 wherein the support is metallic.

11. (Rejected) A sensor as in claim 4 wherein the open areas of the support are formed into one of a rectangular or a hexagonal pattern.

12. (Rejected) A sensor as in claim 4 which includes a housing, and wherein the support includes a rim that is fused or welded to the housing.

13. (Rejected) An electrochemical gas sensor comprising:

a housing that defines an internal region;

first and second electrodes carried by the housing in the region;

an electrolyte between the electrodes;

a retaining mesh that is attached to the housing and is only approximately 0.1 mm thick, covering a predetermined area of one of the electrodes and which presses the one electrode and the

electrolyte toward the other electrode, an open portion of the mesh exceeds 60% of the area covered by the mesh.

14. (Rejected) A sensor as in claim 13 wherein the mesh is formed of elongated linear members having a width less than .5mm.

15. (Rejected) A sensor as in claim 13 wherein the mesh has a thickness less than .5 mm.

16. (Rejected) A sensor as in claim 13 where the open portion of the mesh comprises a plurality of one of rectangular or hexagonal patterns.

17. (Rejected) A sensor as in claim 13 where the open portion of the mesh exceeds 70% of the area.

18. (Rejected) A sensor as in claim 17 where the electrodes are metallic and the mesh is flexible.

19. (Rejected) A sensor as in claim 13 where the open portion of the mesh exceeds 90% of the area.

IX. EVIDENCE APPENDIX

No evidence has been submitted with the appeal.

X. RELATED PROCEEDINGS INDEX

There are no proceedings related to this appeal.